

CHAPTER 3

Africa's Non-Renewable Natural Resources

Introduction

This chapter focuses on Africa's non-renewable natural resources — fossil fuels (coal, gas, and oil) and minerals — in line with the classification of natural resources presented in Chapter One of this Report. These natural resources are examined in terms of their stock (reserve), production (extraction), consumption patterns in Africa, trade characteristics and outlook for the future. The first part of the chapter thus provides a detailed analysis for each main resource. This is followed by a review of AfDB support to the extractive industries, and finally, an overview of key management principles and practices implemented in Africa.

Metals and mineral exports contribute significantly to the economies of resource-

rich African countries. In fact, all of Africa's top five exports are mineral-related — as illustrated in Table 3.1.

Although Africa ranks high in terms of resources, its share of world base metal and mineral fuel *consumption* is very modest, a consequence of the continent's low level of industrialization, economic status, and per capita consumption patterns. For instance, Africa's share of world steel consumption is only about 2 percent.

Fossil Fuels

Coal

The majority of Africa's coal resources are located in southern and western Africa. The major deposits are found in Botswana, the Democratic Republic of Congo (DRC),

Table 3.1: Top Five African Exports by Value (2005)

Product	Value in 2005 in USD Thousand	Share in World Exports, %
Petroleum oils and oils obtained from bituminous minerals, crude oil	133,534,293	17
Petroleum oils and oils obtained from bituminous minerals (other than <i>crude oil</i>)	19,283,817	5
Natural gas, liquefied	7,968,296	18
Diamonds, non-industrial un-worked or simply sawn, cleaved or bruted	7,497,806	22
Bituminous coal, pulverized or not, but not agglomerated	3,180,845	8

Source: Trademap (2007), International Trade Database Online: <http://www.trademap.org>

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Mozambique, Nigeria, South Africa, and Zimbabwe; while minor deposits are found in Senegal, Benin, Niger, Somalia, Ethiopia, Tanzania, Zambia, Malawi, Madagascar, Egypt, and Morocco (see map in Figure 3.1). By a large margin, the majority of the continent's estimated recoverable coal reserves are located in South Africa — 34 billion tons as estimated in 2005 — making South Africa the sixth-largest holder of coal reserves in the world.

Coal is the world's fastest growing fossil fuel with an annual production increase of 6.4 percent since 2004. African coal production rose 1.9 percent in 2005, compared with 2004 levels, accounting for about 5 percent of total world anthracite and bituminous coal production¹. Most of the increase in African coal production was attributable to South Africa, which alone accounted for 98 percent of the regional coal output (Zimbabwe accounted for about 1 percent and others even less). More than 99 percent of South Africa's coal production was bituminous. South Africa produced 244.7 million tons of saleable coal in 2006, making the country the fifth-largest coal producer in the world, after China, the United States, India and Australia². Output also increased in Botswana and Zambia, but fell in Zimbabwe, owing to resource depletion in a key mine.

In 2005, Africa accounted for 3.4 percent of world coal consumption, up 12.3 percent from 2001 levels³. Within the region, South

Africa accounted for 91.6 percent of total African coal consumption. Some 177.1 million tons of production was sold locally in South Africa in 2006, for about R16.2 billion (approx. USD 2.5 billion). Of the local sales, demand was primarily from the energy sector, which uses coal to meet more than 77 percent of primary energy needs and 90 percent of electricity production needs.⁴

The overwhelming majority of African coal is exported through the port of Richards Bay in South Africa. Total exports in 2006 stood at 66.4 million tons, valued at USD 3 billion. Coal export infrastructure constraints were the reason for the decrease in exports compared with the previous year (Table 3.2).

As Table 3.2 shows, the value (USD) of South African coal has risen considerably, mainly attributable to increased demand — primarily in Europe — and the resulting better prices. This increased demand stems from the lack of availability of coal from

Table 3.2: South African Exports of Bituminous Coal

Year	Value	Quantity (Kg)
2002	USD 1,766,650,752	67,703,353,344
2003	USD 1,715,920,512	67,723,550,720
2004	USD 2,349,846,532	65,066,798,084
2005	USD 3,178,112,786	72,462,039,856
2006	USD 3,046,010,963	66,436,604,280

Source: UN Comtrade (2007), United Nations Commodity Trade Database Online

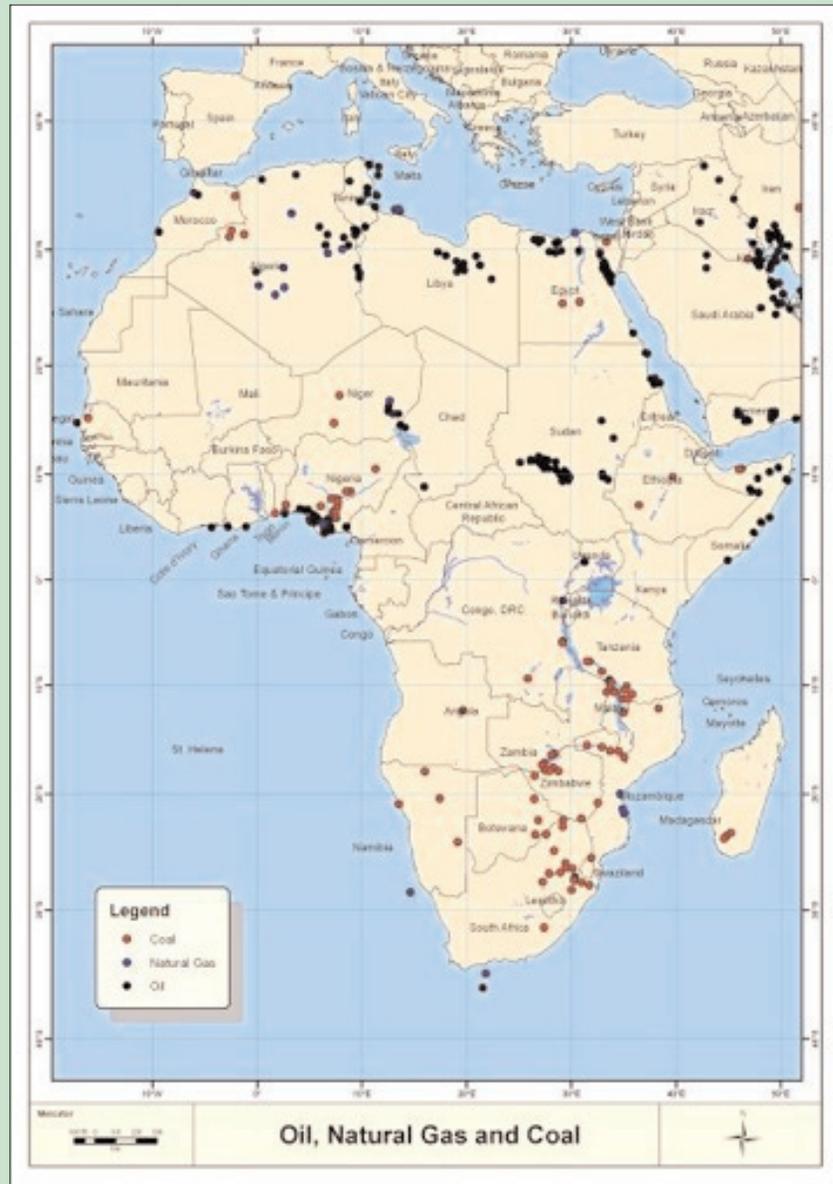
¹ British Petroleum (2006)

² South African Department of Minerals and Energy (DME) (2007): <http://www.dme.gov.za>

³ British Petroleum (2006)

⁴ DME (2007): The South African Department of Minerals and Energy: <http://www.dme.gov.za>

Figure 3.1: Oil, Gas and Coal Resources of Africa



Source: Council for Geoscience and Mintek (2007)

Table 3.3: World Coal Production by Region, 2004–2030 (Quadrillion Btu)

Country	2004	2010	2015	2020	2025	2030	Average Annual % Change, 2004–2030
Africa	5.9	7.1	7.7	8.0	8.6	8.9	1.6%
China	43.0	55.4	64.6	74.3	83.4	93.4	3.0%
Total World	113.4	136.6	152.1	167.7	183.8	199.9	2.2%

Source: Energy Information Administration (EIA) (2007)

European producers, depleting stockpiles, and an unstable and unreliable supply from Russia. Exports to Asia, which have been eroded somewhat in recent years, may return to former levels with a potential rise in demand for South African export coal, especially from India.⁵

The outlook for African coal production is relatively bright, with an expected average increase of 2 percent per year up to 2011:

- South Africa is likely to be responsible for the majority of the increase, as its production could increase to 266 million tons by 2009.
- Mozambique is expected to become the second-ranked coal producer in Africa, with the development of the Moatize Project in 2009.
- The National Development Corporation of Tanzania has plans to start production at Mchuchuma in 2008.
- Zimbabwe's output could rise because of the opening of the 3 Main Mine.
- In Botswana, production is expected to rise at the Morupule Colliery

because of domestic power plant expansion.

- Production is also expected to rise in Malawi and Nigeria.

In the longer term, world coal production is forecasted to increase at an annual rate of 2.2 percent up to 2030 (Table 3.3), whereas African production is expected to rise at a below-average rate of 1.6 percent over the same period (and Chinese production at around 3 percent per annum).

Crude Oil and Petroleum

Africa's major *known* deposits of crude oil are located towards the north of the continent, in Algeria, Chad, Egypt, Libya, Morocco, and Tunisia; and in Nigeria and Angola in the south. Table 3.4 presents an overview of the most important oilfields.

In 2005, Africa produced 9.8 million barrels of oil per day, bringing its share of world crude petroleum production to 11.6 percent. Nigeria accounted for more than a quarter of the continent's production (see Table 3.5). The rise in Nigeria's output resulted from investments and an increased production quota authorized by the

⁵ Creamer Media (2006)

Table 3.4: Major African Oilfields

State	Deposit Name	Size of Resource (Barrels)	Status
Algeria	Hassi Messaoud North & South	> 300 million	Continuously producing
Algeria	Rhourde El Baguel; Hassi Berkine South; ZarzanTine; and Edj'leh	All 4 Resources: 160–300million	Continuously producing (all)
Angola	29 offshore and onshore blocks	Several resources >160 million within blocks	Some producing
Chad	Doba	160–300million	Deposit never exploited
Egypt	El Morgan ; and July Oilfield	160–300million	Continuously producing
Gabon	Emeraude; Loango	> 300 million	
Libya	Zelten	160–300million	Derelict mine
Libya	Waha; Amal; Serir; Gialo; and Dahra	All Resources: 160–300million	Continuously producing (all)
Morocco	Meskalia	160–300million	Continuously producing
Nigeria	Usan; Ukot; Aparo; Agabami; and Bonga Sw	All Resources: 160 million	Continuously producing (all)
Nigeria	Jones Creek	160–300million	Continuously producing
Tunisia	El Borma	160–300million	Continuously Producing

Source: Council for Geoscience and Mintek (2007)

Organization of Petroleum Exporting Countries (OPEC). Increases in production were also recorded in Libya, Chad, Sudan, Angola, Algeria, and Equatorial Guinea, mostly attributable to production start-up in new fields.

African consumption of petroleum products increased to 1.01 billion barrels in 2005 from 0.97 billion barrels in 2003 and 0.89 billion barrels in 1999. However, this represented only 3.2 percent of consumption of world petroleum products (Figure 3.2). Middle distillate products accounted for 42 percent of demand; light distillates, 23 percent; and fuel oils and others, around

17 percent each. Egypt accounted for 22 percent of African consumption of petroleum products; South Africa, 19 percent; Algeria, 9 percent; while other African countries made up the remaining 50 percent.⁶

In 2005, Africa exported 37 percent of its petroleum to Europe; 36 percent to the United States; 9 percent to China; 2 percent to Japan; and 14 percent to other countries in the Asia–Pacific region. The following special characteristics are worth noting:⁷

⁶ British Petroleum (2006)

⁷ TradeMap (2007): International Trade Database Online: <http://www.trademap.org>

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Table 3.5: Major African Producers of Crude Petroleum (million tons)

Country	2001	2002	2003	2004	2005
Nigeria	99.5	88.8	106.9	123.6	127.26
Libya	63.7	61.6	69.0	75.8	82.0
Algeria	57.1	61.4	68.5	71.8	74.6
Angola	36.4	44.6	43.6	49.0	61.0
Egypt	32.6	34.9	35.0	33.2	31.9
Sudan	10.4	11.5	12.6	14.9	18.6
Equatorial Guinea	9.0	11.7	12.3	17.4	17.8
Gabon	15.0	14.7	12.0	11.8	11.6
Congo	12.1	11.5	10.8	10.6	11.3
DRC	13.1	12.5	11.6	11.1	11.0
Chad			1.3	8.8	9.3
Tunisia	3.3	3.5	3.1	3.3	3.4
Cameroon	4.1	3.7	3.5	3.2	2.9

Source: British Geological Survey (BGS) (2006)

- Countries forming part of the Economic Community of West African States (ECOWAS) sent 56 percent of their exports to the United States and 20 percent to Europe.
- North African countries sent 78 percent of their exports to Europe and 22 percent to the United States.
- Intraregional exports to African countries accounted for only 2 percent of total African petroleum exports.

African crude petroleum production is expected to increase from 2007 to 2011, dependant on continued growth in demand, discovery of new oilfields as well as the potential detrimental effect of civil conflicts

and war. Production rose nearly 18 percent from 2004 to 2007:⁸

- In Nigeria, annual output is likely to increase to 1.2 billion barrels in 2007, and the share of African crude petroleum production is expected to rise by about 31 percent in 2011 — although the recent civil conflict in the Niger Delta makes estimates somewhat uncertain.
- Sudan's output more than doubled, from 2004 to 2007, and the level is expected to remain steady.
- In Libya, an increase in production is likely, partially attributable to higher output from Elephant Field onshore Block NC-174 in the Murzuq Basin.
- Higher production is expected from Block 15 in Angola.
- Output is also likely to increase in Algeria.

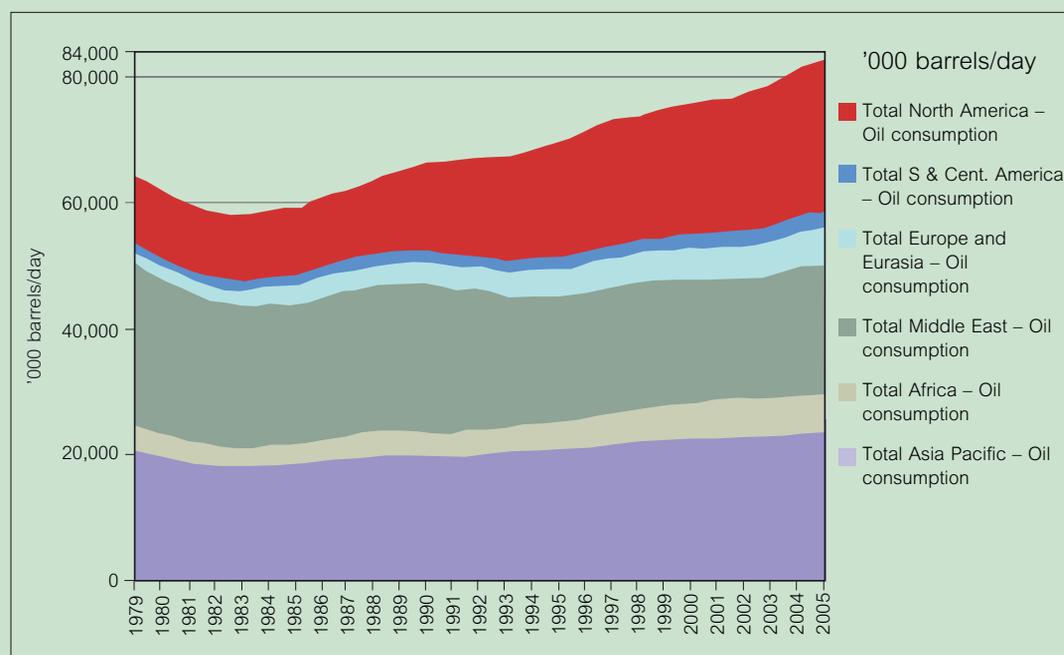
Natural Gas

Africa's largest deposits of natural gas are located in Algeria and Mozambique, with other significant occurrences in Libya, Niger, Morocco, Nigeria, Rwanda, Ghana, Egypt, Tunisia, and off the coasts of South Africa, Tanzania and Namibia.

African production of dry natural gas amounted to 163 billion cubic meters in 2005, an increase of 13 percent from 2004. Libya accounted for most of the increase in output (up 79.5 percent), with higher production attributable to the start-up of the Wafa Field. The initialization of the North Tano, Songo Songo, and Temane projects

⁸ USGS (2005)

Figure 3.2: World Oil Consumption by Region (1979–2005)



Source: British Petroleum (2007)

in Ghana, Tanzania, and Mozambique, respectively, also helped boost production. Nevertheless, Algeria is by far the biggest producer, accounting for 54 percent of Africa's dry natural gas output in 2005. Nigeria contributed 13 percent, up from only 5 percent in 1999. Table 3.6 shows natural gas production by country between 2001 and 2005.

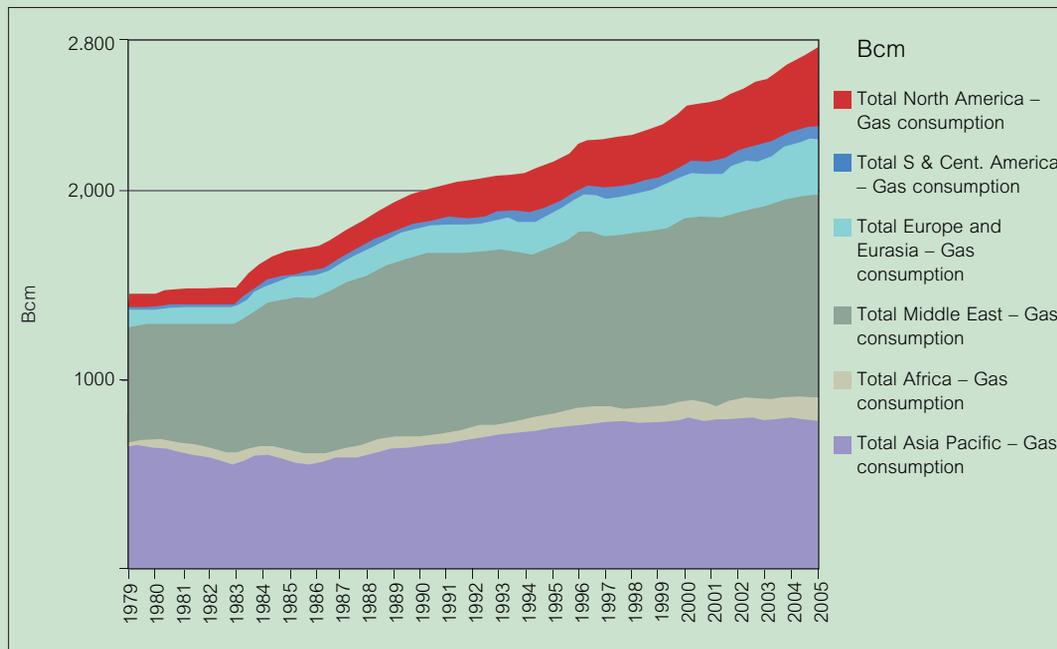
The African continent consumed nearly 3 percent of the world's natural gas in 2005 (Figure 3.3). This is equivalent to 71.2 billion cubic meters, compared with 68.6 billion cubic meters consumed in 2004 and 50.9 billion cubic meters in 1999. Egypt

Table 3.6: Natural Gas — Major African Producers (billion cubic meters)

Country	2001	2002	2003	2004	2005
Algeria	78.2	80.3	82.8	82.0	87.8
Egypt	18.3	19.6	17.6	14.0	34.4
Nigeria	15.6	15.1	19.2	22.3	21.8
Libya	6.2	6.2	6.4	7.0	11.7
Other	2.2	3.7	4.3	4.8	6.3

Source: BP Statistical Review (2006); BGS (2006)

Figure 3.3: Natural Gas Consumption per Region (1979–2005)



Source: British Petroleum (2007)

accounted for 36 percent of Africa’s dry natural gas consumption; Algeria, 34 percent; and others, 30 percent.⁹

In 2005, Africa exported 37 million tons of natural gas, worth more than USD 10 billion. Liquefied natural gas (LNG) accounted for 79 percent of exports, giving Africa an 18 percent share in world LNG trade. A significant share of African natural gas exports were to Europe, with Spain as the primary importer. Algeria is by far the

largest exporter, exporting to the value of almost USD 9 billion in 2005.¹⁰

African production of dry natural gas is expected to rise an additional 5 percent from 2007 to 2011, having already gone up nearly 28 percent from 2004 to 2007:¹¹

- Algeria’s output of natural gas is likely to increase because of new

⁹ British Petroleum (2006)

¹⁰ DTI (2005): Department of Trade and Industry (DTI) (SA) Economic Database: <http://www.dti.gov.za/econdb/>

¹¹ USGS (2005)

production from the Gassi Touil Field in 2007.

- In Libya, production is likely to increase considerably to 8 billion cubic meters in 2011.
- The increase in Nigeria's production is partially attributable to the West African Gas Pipeline, and the planned elimination of natural gas flaring.
- Production could also increase at Temane in Mozambique and Songo Songo in Tanzania.
- However, Egypt's production is likely to start declining by 2009.

Minerals (Metals and Non-Metals)

The African continent is endowed with a diverse mix of minerals¹², including precious, ferrous, non-ferrous, and industrial minerals. Table 3.7 illustrates Africa's domination of some of the world's mineral resources supply. For example, it is the top producer of platinum and gold and has very large shares of world reserves. One country, South Africa, stands out in Africa. It is the world's leading producer of chromite and ferrochromium, gold, palladium, platinum, and vanadium and the world's second ranked producer of manganese and ferromanganese, rutile, and zircon. Nevertheless, considering the reserves, the production of several minerals

¹² A mineral is a naturally occurring substance formed through geological processes; it has a characteristic chemical composition, a highly ordered atomic structure, and specific physical properties. A rock, by comparison, is an aggregate of minerals and need not have a specific chemical composition. Minerals range in composition from pure elements and simple salts to very complex silicates with thousands of known forms.

Table 3.7: African Mineral Resources (2005)

Mineral	African % of World Production	Rank	African % of World Reserves	Rank
Platinum	54	1	60	1
Gold	21	1	42	1
Chrome	40	1	44	1
Manganese	28	2	82	1
Vanadium	51	1	95	1
Cobalt	60	1	55	1
Diamonds*	78	1	88	1

* Mine production

Source: United States Geological Survey (USGS) (2005); BGS (2006)

is comparatively small in Africa and, for some minerals, the production trend has been declining. For instance, mine production of bauxite, copper, and lead decreased in the period from 1990–2005.¹³

The following sections further outline production trends and other key aspects of the most important mineral resources found in Africa.

Energy Minerals

Uranium: Africa's largest deposits of uranium are located in Namibia and Niger, with further above-than-average occurrences in Algeria, the Central African Republic, Gabon, and South Africa. However, several large African uranium deposits are still unexploited; for instance some considerable deposits in Namibia and South Africa.¹⁴

¹³ USGS (2005); BGS (2006)

¹⁴ Council for Geoscience and Mintek (2007)

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African uranium production dropped slightly by 2.2 percent in 2005, following a sizeable increase of 19 percent in 2004. The continent contributed 16.6 percent to global production. Niger overtook Namibia as the continent's primary producer, accounting for 46 percent of African uranium production, while Namibia accounted for 45 percent, and South Africa, 9 percent. Comparatively, in 1990, Niger's and South Africa's shares of continental production were 30 percent and 27 percent, respectively. Total African production was 6,914 tons, with the majority being exported to France¹⁵. Needless to say, uranium is a very important export commodity for Niger and Namibia.

In 2005, Africa accounted for only 0.47 percent of the global supply of electricity generated by nuclear power. South Africa was the only regional consumer of uranium, with 2.9 million tons of oil equivalent used. This situation is not expected to change in the foreseeable future.¹⁶

Continental uranium mine production is expected to rise by more than 4 percent per year from 2004 to 2011, and Africa's total share of world uranium mine production is expected to remain at about 16 percent in 2011. A number of important developments are expected:¹⁷

- In South Africa, the Dominion mine is scheduled to open this year (2007) and to produce more than 1,500 tons per year of uranium by 2010.
- Paladin Resources Ltd. of Australia is developing the Kayelekera Project in

Malawi, which could produce about 850 tons annually of uranium, starting in 2008 or 2009.

Precious Metals and Minerals

Gold: Africa's largest deposits of gold are located in South Africa, Ghana, and Tanzania, with further sizeable occurrences in Mozambique, Zimbabwe, the DRC, Algeria, Mali, Sierra Leone, Senegal, the Ivory Coast, Guinea, Burkina Faso, Niger, and Ethiopia (see Table 3.8 and Figure 3.4).

The mine production of gold in Africa was 552 tons in 2006, a 14 percent decline compared with production in 1995. This is due mainly to a long-term decline in South African production. Correspondingly, Africa's share of world gold mine production fell from 32 percent to about 21 percent from 1990 to 2006. Despite the significant fall in production, South Africa remains the world's top gold-producing country, producing 294 tons in 2005 (Table 3.9) and 270 tons in 2006, although closely followed by the United States and Australia with approximately 260 tons each (in 2006).¹⁸

In 2006, South Africa accounted for 54 percent of African gold production; Ghana, 12 percent; Tanzania, 11 percent; and Mali 10 percent. South Africa's share of continental gold production has fallen steadily, from 89 percent in 1990 to 81 percent in 1995, because of rising production costs associated with deeper underground operations (lower production) and increased production in Ghana, Guinea, Mali, and Tanzania (Table 3.9).

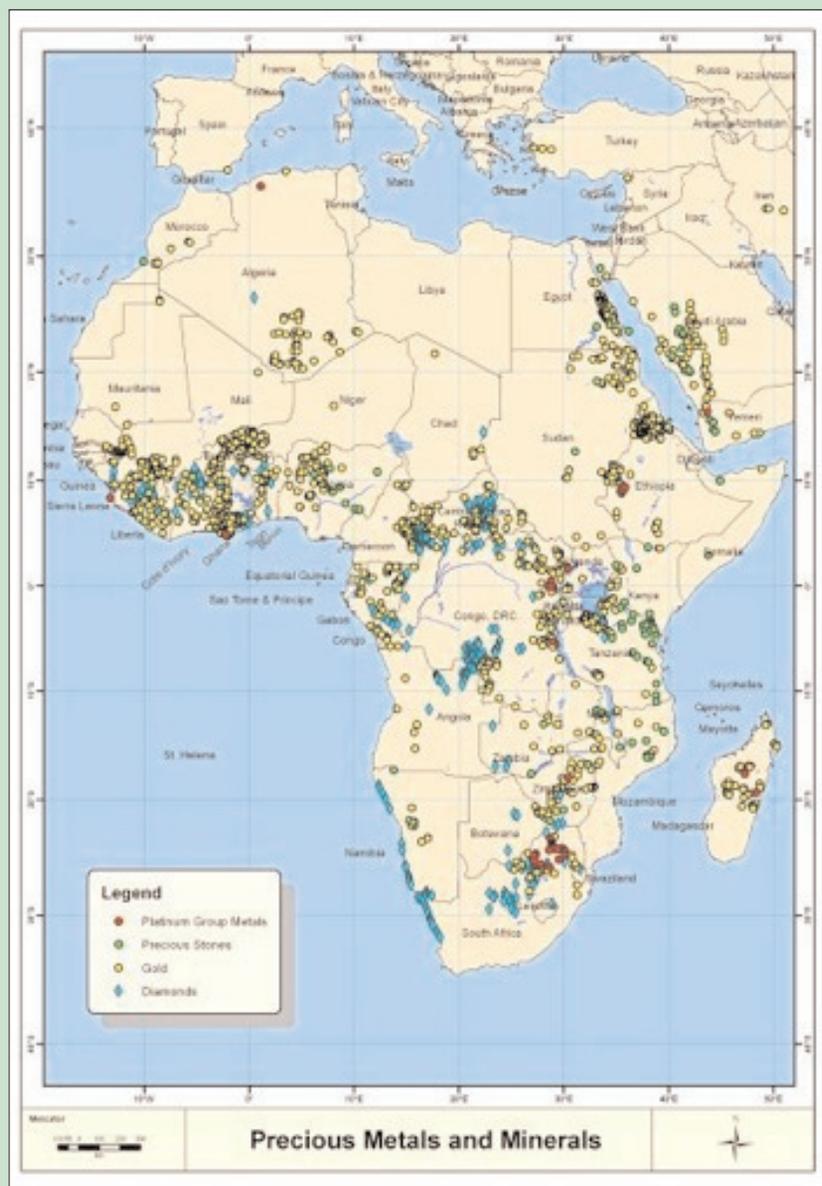
¹⁵ DME (2007)

¹⁶ British Petroleum (2006)

¹⁷ USGS, (2005); Mining Review Africa (2005)

¹⁸ Creamer Media (2007)

Figure 3.4: Precious Minerals and Metals in Africa



Source: Council for Geoscience and Mintek (2007)

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Table 3.8: Gold - Major African Deposits

State	Deposit Name	Size	Status *
Ghana	Prestea	25t–50t	Intermittently producing
Ghana	Obuasi (Ashanti Gold Mine)	25t–50t	Continuously producing
S. Africa	West Rand	50t–100t	Continuously producing
S. Africa	East Rand	50t–100t	Continuously producing
S. Africa	Far West Rand	50t–100t	Continuously producing
S. Africa	West Wits Line	50t–100t	Continuously producing
S. Africa	Evander	50t–100t	Continuously producing
S. Africa	Klerksdorp	50t–100t	Continuously producing
S. Africa	Free State Gold Field	50t–100t	Continuously producing
S. Africa	New Consort	25t–50t	Continuously producing
Tanzania	Bulyanhulu	25t–50t	Continuously producing

* Excludes abandoned mines.

Source: Council for Geoscience (CGS) and Mintek (2007)

Table 3.9: Major African Producers of Gold (tons, metal content)

Country	2001	2002	2003	2004	2005
South Africa	394.7	398.2	372.7	337.2	294.8
Ghana	70.0	69.5	70.7	63.1	66.5
Tanzania	30.0	43.2	48.0	48.1	45.4
Mali	41.2	56.0	45.5	37.9	44.1

Source: BGS (2006)

In a global context, Africa's consumption of gold is insignificant. Indeed, although the continent produces 21 percent of world gold, it only accounts for 4 percent of total global consumption.¹⁹

Africa accounts for approximately 3 percent of total trade in unwrought forms

¹⁹ UNCTAD (2006)

and 6 percent in non-monetary gold powder. The major importers of African gold in unwrought forms were Switzerland, Canada, the United Kingdom and South Africa, for smelting purposes. The major importers of African non-monetary powder gold are Israel, the United States of America, Belgium, South Africa, and Germany. There is also significant intra-regional trade for gold. South Africa imports about 150,000 kg annually, mostly from West African countries, to supply its gold refineries. The majority of African gold mine production is thus refined in South Africa prior to export to other regions.²⁰

Gold mine production in Africa is expected to rise slightly until 2009 and then to decline by about 4 percent in 2011. Expected decreases in output in Mali, South Africa, and Tanzania could more than offset

²⁰ TradeMap (2007), International Trade Database Online: <http://www.trademap.org>

increased production in other countries. The long-term decline for the main producing country, South Africa, is likely to be reversed temporarily in 2009 because of the completion of several important mine projects; but the long-term trend is expected to prevail with the abandoning of mines and reduced production. The situation is basically the same in Mali and Tanzania with some important projects coming 'online', while others are being shut down or are in decline. In Ghana, however, the outlook calls for a modest increase in output owing to higher production from the Wassa Mine. Botswana's output could increase sharply because of higher production from the Mupane Mine.²¹

Several African countries that were involved only in artisanal gold production in 2004 are likely to open large-scale gold mines in the near future. In Mauritania, the Tasiast Gold Mine is expected to start production this year (2007). The recently opened Taparko Mine is expected to increase Burkina Faso's output. Plans are underway to mine gold-rich zones in Bisha, Eritrea from 2008 to 2010. In the DRC, the Kilo Moto Mine could open in 2009. Furthermore, by 2008, World Bank-sponsored projects in Madagascar and Uganda could lead to significant increases in reported artisanal gold production.²²

Platinum Group Metals: Virtually all of the continent's platinum group metals (PGMs) resources are located in South Africa's Bushveld Igneous Complex (BIC), with smaller deposits in Zimbabwe. The BIC,

located in the northern reaches of South Africa, was formed about two-billion years ago and has a series of distinct layers, three of which have economic concentrations of PGMs. Platinum and palladium production from the BIC represents 72 percent and 34 percent, respectively, of annual global production. Estimates of the platinum and palladium resources of the BIC of proven and probable reserves of platinum and palladium stand at 203.3 and 116.1 million oz., respectively. Inferred resources were estimated at 939 million ounces of platinum and 711 million oz. of palladium. These figures stand to increase if other PGM-bearing reefs in the BIC are mined, or if mining extends to depths below two kilometers.²³

Zimbabwe's platinum deposits are located in a geological sequence known as the Great Dyke — an igneous intrusion that is 30 km wide and 550 km in length and spans almost the length of Zimbabwe in a north-to-south direction. Within the dyke there is horizontal layering, with distinctive zones of certain rock types evident. PGM-bearing ore is found between the surface and 500 m in depth.²⁴

In 2005, Africa's production of platinum increased by 3 percent. South Africa, which is the continent's largest producer of PGMs, accounted for 97 percent and 96 percent of the production of platinum and palladium, respectively. Indeed, it produced 5.11 million oz. of platinum, which represented 77 percent of global platinum production in 2005. This rise in production was

²¹ USGS (2007)

²² Ibid.

²³ Johnson (2007)

²⁴ Ibid.

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Table 3.10: South African Platinum Exports by Destination

Importers	Exported Value 2005 (in Thousands of USD)	Share of SA's Unwrought Platinum Exports,%	Export Growth in Value 2004–2005 (% , P.A.)	Total Import Growth in Value of Partner Countries 2001–2005,% , P.A.
World	2,003,326	100	79	17
USA	672,376	34	25	15
Germany	405,127	20	21	26
Japan	343,286	17	309	24
UK	287,719	14	311	42
Switzerland	229,857	11	273	9

Source: Trademap (2007), International Trade Database Online: <http://www.trademap.org>

attributable to higher output from the Kroondal, the Impala, the Modikwa, and the Rustenburg Mines. Zimbabwe also recorded a higher output in 2005, with 156,000 oz. of platinum produced, and production is expected to increase in the coming years — to around 3 percent of global production.²⁵

Africa does not consume significant amounts of platinum — the vast majority of the platinum is exported to major automotive and jewelry manufacturers in the United States and Asia. Total global demand for platinum in 2005 stood at 6.775 million oz., up on the previous year's demand of 6.695 million oz. and above the total supply of 6.650 million oz. for the year. Demand in 2007 is forecast to reach a record 7.02 million oz. while supply is expected to be slightly less — in other words, in all likelihood leading to continued high prices.²⁶

The majority of African platinum is exported either in unwrought or semi-manufactured forms to Europe, Asia, or the

United States. Table 3.10 further illustrates the value and destination of South African platinum. Europe remained the top export destination for unwrought platinum in 2006, having overtaken the United States in 2005. Asia (especially Japan) maintains its position of primary importer of semi-manufactured platinum products, mainly for use in the jewelry sector.

African mine production of palladium is expected to increase by a further average of 3 percent per year to 2011, and platinum, by between 2 percent and 3 percent per year.

Diamonds: Africa is the richest and by far the most important continent for diamond-mining, accounting for more than half of world production. The main African sources are in the south, with lower concentrations in the west and central parts of the continent.

World mine production of diamonds in 2005 is estimated at 170 million carats (Mct), a 10-percent increase compared with the revised total for 2004 (154 Mct). It is estimated that the value of mine production increased 16 percent, from USD 10.6 billion

²⁵ Johnson (2007); BGS (2007)

²⁶ Johnson (2007)

the year before to USD 12.4 billion in 2005. In 2005, Africa's share of world diamond production by volume stood at 52 percent. The increase in worldwide production (volume) resulted from significant increases in production in Australia, Russia and, not least, South Africa. The DeBeers Group, which has mines in Botswana, South Africa, Namibia, and Tanzania, contributed 49 Mct carats, or 29 percent, to world production by mass and an estimated USD 5.1 billion (41 percent) by value.²⁷

Botswana retained its rank as the top producer in Africa by value in 2005 (Table 3.11). Most of Botswana's output was produced by the three larger Kimberlite Mines: Jwaneng (15.6Mct), Orapa (14.8Mct), and Letlhakane (1.1Mct). However, production in the Democratic Republic of Congo (DRC) has increased in recent years owing to operations by small operators and artisanal miners.

Table 3.11: Major African Producers of Diamonds (Mct)

Country	2001	2002	2003	2004	2005
Botswana	26.2	28.3	30.4	31.1	31.8
DRC	19.6	22.0	29.0	29.0	27.0
South Africa	11.1	10.8	12.6	14.3	15.8
Angola	5.1	5.7	6.3	7.5	10.0
Namibia	1.5	1.4	1.5	2.0	1.9

Source: BGS (2006)

²⁷ DME (2007)

Diamond production continues to be an important industry for specific countries in West Africa, although the sub-region only accounts for about 2.5 percent of Africa's total production (see Figure 3.5). Nevertheless, diamond resources — and other natural resource-related and geo-political issues — have been key factors in several civil wars and regional conflicts in the area. This is described in further detail in Chapter 4.

The United States continues to be the major global market for gem-quality stones. In 2006, the U.S. market for unset gem-quality diamonds was estimated to have exceeded USD 16.2 billion, accounting for more than an estimated 35 percent of world demand²⁸. The major diamond trading centers of Belgium, Israel, and India continue to be the main importers of polished diamonds from Africa.²⁹

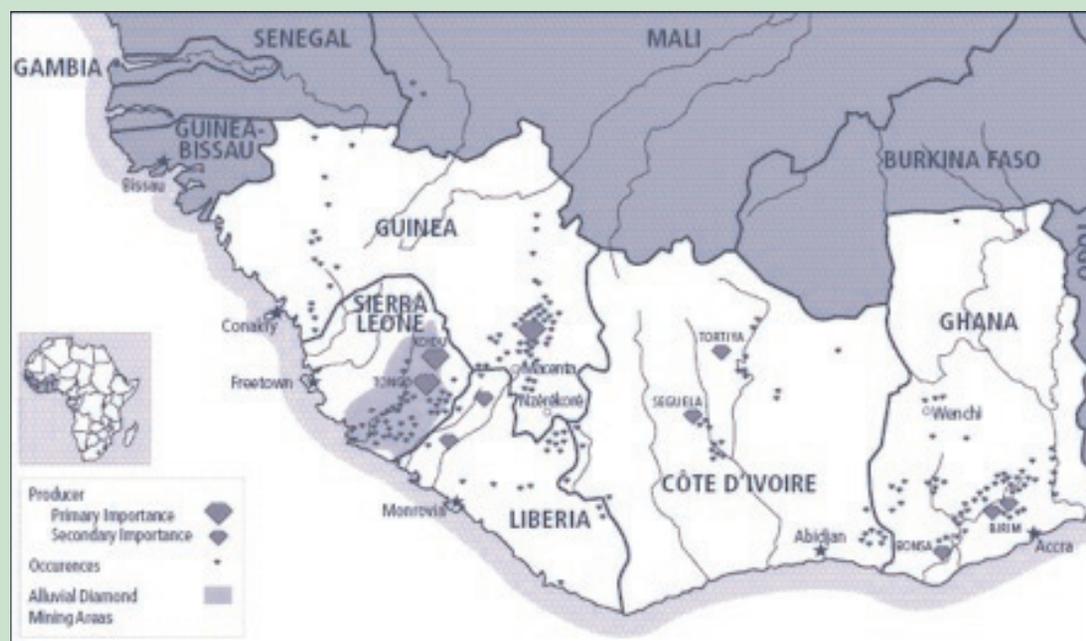
Although Africa produces more than half of the world's gem-quality diamonds, the majority of its rough diamonds are exported without any value addition — owing to the lack of beneficiation facilities (Table 3.12). The majority of beneficiation takes place in the major diamond trading hubs of Belgium, Israel, and India.

With regard to the influence of the Kimberley Process Certification Scheme (KPCS) on illegal diamond trade (described in detail in Chapter 5), available data suggests that a considerable percentage of the international trade in rough diamonds is now carried out within the framework. Today, over 99 percent of all diamonds are

²⁸ USGS (2007)

²⁹ TradeMap (2007): International Trade Database Online: <http://www.trademap.org>

Figure 3.5: Diamond Operations in West Africa



Source: The Diamonds and Human Security Project (2006)

Table 3.12: African Diamond Exports

HS Code	Product Label	Africa's Exports to World	
		Value 2005 (in Thousands of USD)	Annual Growth in Value 2001–2005, (%)
710210	Diamonds, unsorted, worked or not	48,975	-73
710221	Diamonds, industrial, unworked or simply sawn, cleaved, or bruted	169,052	123
710231	Diamonds, non-industrial, unworked or simply sawn, cleaved, or bruted	7,497,806	60
710239	Diamonds non-industrial not specified elsewhere, excluding mounted or set diamonds	851,999	12

Source: Trademap (2007), International Trade Database Online: <http://www.trademap.org>

certified, through the Kimberley Process, to be from conflict-free sources.

African production of rough diamonds is expected to rise by an average of 3 percent per year to 2011:³⁰

- In Angola, the Fucauma, the Kamachia-Kamajiku, the Luarica, and the Rio Lapi Garimpo Mines are expected to contribute to higher output, Angola's share of African diamond production could rise to 11 percent in 2011.
- Production could also rise in Congo (Kinshasa), with the expansion of established schemes.
- Mining exploitation is being pursued in Lesotho, with promising opportunities.
- Zimbabwe's production could increase because of higher production in Murowa.
- Output is also expected to rise in Botswana, Namibia, and South Africa because of higher production at mines operated by the DeBeers Group.

Ferrous Metals

World consumption of ferrous minerals has surged in recent years, due mainly to an acceleration in worldwide growth, especially the continuing double-digit growth of the Chinese economy and the demand for crude steel supply. In 2005, world steel production rose to a new record of 1,128.9 million tons, 6.6 percent higher than the previous record of 1,058.5 million tons attained in 2004. In China, output increased 26.3 percent to 349.0 million tons, account-

ing for a 31 percent share of world production; Chinese imports of iron ore rose 32 percent in 2005. World crude steel production continued to increase during 2006 and was 6 percent higher in the first half of 2007, compared with the same period in 2006. Apart from China, the main growth occurred in India and in other Asian countries (China and India alone increased their output by 18 and 17 percent, respectively³¹).

Metal prices have generally trended higher, along with worldwide economic growth. However, the realization by steelmakers and other stakeholders that considerable price hikes in 2004 were unsustainable led to subsequent attempts to contain or even reverse the increases in metal prices. The results have been very mixed: the prices of manganese ore and alloys dropped considerably in 2005, while those of chrome ore, silicon metal and vanadium increased significantly. Nevertheless, all indications are that the trend of rising metal prices will continue as long as worldwide growth continues — especially in parallel with the growth in Asia.³²

The major *known* deposits of ferrous metals in Africa are presented in Figure 3.6.

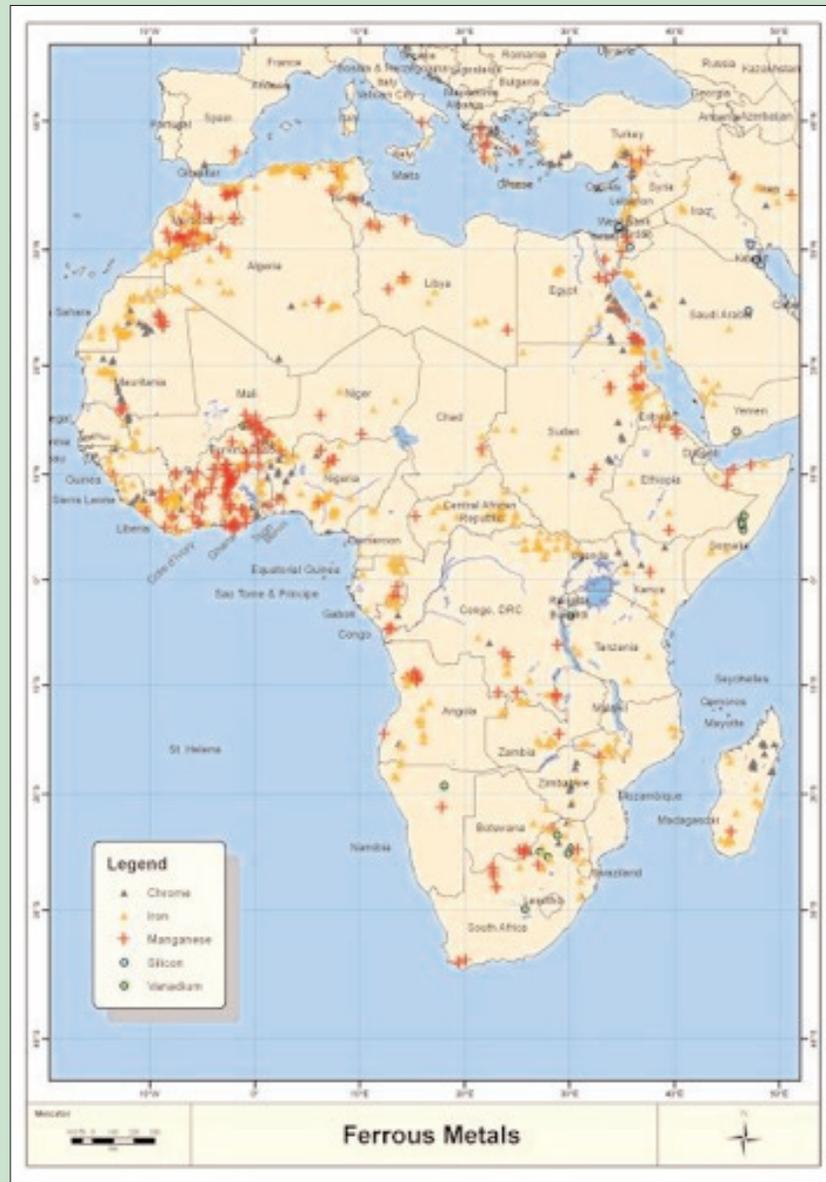
Chrome: Africa's major chromite deposits are located towards the south of the continent, in South Africa, Madagascar, and Zimbabwe (several mines with 1–10 million

³⁰ USGS (2005)

³¹ IISI (2007): International Iron and Steel Institute (IISI): <http://www.worldsteel.org>

³² DME (2007)

Figure 3.6: Main Deposits of Ferrous Metals in Africa



Source: Council for Geoscience and Mintek (2007)

Table 3.13: Major African Producers of Chromite Ores and Concentrates, (000 t)

Country	2001	2002	2003	2004	2005
Madagascar	60.7	10.7	45.0	77.3	140.8
South Africa	5502.0	6435.2	7405.6	7676.3	7502.8
Zimbabwe	780.1	725.8	572.6	668.3	614.2

Source: BGS (2006)

tons; and even up to 100 million tons in South Africa). Other significant deposits, larger than 100,000 tons, are located in Egypt, Sierra Leone, and Sudan. Together, South Africa and Zimbabwe hold more than 84 percent of the world's chromite reserve base — with South Africa contributing 72 percent of this reserve.³³

In 2005, world chromite production rose to 19.3 million tons, a 12 percent increase over 2004 production levels, in response to a shortage of stainless steel scrap and strong ferrochrome prices. Africa contributed no less than 8.0 million tons to the global figure. South Africa was the world's largest producer of chromite, with 7.5 million tons — accounting for nearly 40 percent of total global production, with Zimbabwe adding 0.61 million tons (Table 3.13).

A total of 93 percent of world chromite ore output was converted into ferrochrome for metallurgical applications (in 2005). Of the remaining 7 percent, the refractory industry accounted for 1 percent, while foundries and chemical industries utilized 3 percent each. African exports of chromite ores and concentrates amounted to 1.5 million tons in 2005. This translates into

more than 80 percent of chromite produced being beneficiated (consumed) locally instead of being exported (as a raw material) — in principle a good sign for local industry. However, the majority of the produced ferrochrome in Africa is exported to the world's major steel-producing countries. South Africa thus exported 87 percent of its 2.8 million tons of ferrochrome production, while Zimbabwe exported 90 percent of its 0.26 million tons. Stainless steel production accounts for more than 90 percent of ferrochrome consumption and is the primary influence on world chrome demand.³⁴

The strongest growth in stainless steel demand continues to come from China, which saw a 68 percent increase from 2005 to 2006 (partially based on new capacity coming on-stream during 2006). Total world steel demand grew 7.3 percent to 1,087 million tons in 2006. Moreover, confirming trends established in recent years, forecasts point to an increase in steel use, in line with general economic growth. The predicted growth is 5.8 percent — to 1,150 million tons in 2007. This would require an increase in ferrochrome production approaching 286 million tons, and in ore output approaching

³³ DME (2007)

³⁴ BGS (2006); DME (2007)

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Table 3.14: Major African Producers of Iron Ore (million tons)

Country	2001	2002	2003	2004	2005
Algeria	1.2	1.1	1.4	1.7	1.8
Egypt	1.8	2.7	2.9	2.2	2.5
Mauritania	10.3	9.6	10.1	10.7	10.7
Nigeria	—	0.0078	0.0086	0.0084	0.008
South Africa	34.7	36.4	38.1	39.3	39.5
Tunisia	0.2	0.18	0.16	0.26	0.2
Zimbabwe	0.36	0.27	0.41	0.23	0.22

Source: BGS (2006)

788 million tons. Ferrochrome production capacity in South Africa, in particular, is indeed expected to increase through new projects.³⁵

Iron Ore: Africa's iron ore deposits are well spread out over the continent, with resources larger than 100 million tons in Algeria, Guinea, Mauritania, South Africa, and the Ivory Coast. Other significant deposits, larger than 10 million tons, are located in 21 other African states (Table 3.14). However, most of the known reserve base is in South Africa.

In 2005, iron ore produced in Africa amounted to 55.9 million tons (pure iron content). South Africa was the leading producer in Africa, accounting for 73 percent of continental output, followed by Mauritania, 20 percent; and Egypt, 6 percent.³⁶

In a global context, Africa consumes insignificant amounts of iron ore. China has been the world's largest iron ore-consuming nation since 1992 and has further strength-

ened its position in recent years. Between 1998 and 2006, China accounted for 84 percent of total market expansion. About two-thirds of African iron ore is exported. Not surprisingly, a high proportion of iron ore from Africa was exported to China and the Pacific Rim countries, accounting for close to 65 percent of export volumes in 2005. Overall export sales shrank 4 percent to 26.6 million tons, but the revenue from export sales rose 81.6 percent from 2003 to 2005, owing to higher iron ore prices.³⁷

Demand for, and production capacity of, iron ore are expected to increase over the coming years. Iron ore producers thus appear confident that the current boom will continue and absorb any additional capacity planned ahead. Chinese demand for iron ore is likely to be the key determinant of the outlook for the global industry in the short to medium terms; hitherto, growth has continued to be impressive. South Africa's iron ore industry is generally well geared for future demands and has initiated various

³⁵ DME (2007)

³⁶ BGS (2007)

³⁷ USGS (2005); Harmse and Finca (2007)

infrastructure developments, including the provision of more rolling stocks as well as expansion of 107 export facilities at the ports, thus raising South Africa's capacity to meet the surging demand for its iron ore.³⁸

Manganese: Africa's manganese deposits are well spread out over the continent, with resources larger than 10 million tons found in Burkina Faso, Gabon, Ghana, Namibia, South Africa, and Togo. Other significant deposits (larger than 1 million tons) are located in 17 other African states. However, like chrome and iron ore, the majority of the known reserve base is in South Africa.

The 3 major African producers are South Africa, Gabon, and Ghana. Significantly higher outputs have been noted in recent years, especially in Gabon and in South Africa (Table 3.15).

African exports of manganese ore and concentrates amounted to 6.67 million tons — worth an estimated USD 723 million (2005). From 2001 to 2005, manganese ore exports experienced an impressive annual growth rate of 26 percent. The majority of exports were from South Africa; however,

although South Africa holds 80 percent of world manganese resources, it only accounts for about 20 percent of the manganese ore world export market.³⁹

The outlook is clearly that growth in world crude steel output, the major driver of demand for manganese, will continue to secure a strong demand for African manganese resources. It is estimated that world steel production will reach 1245 billion metric tons by 2010, further stimulating manganese demand and production.⁴⁰

Industrial Minerals

Phosphate: Africa's phosphate rock deposits are well spread out over the continent. The larger resources (> 10 million tons) are located to the south and north of the continent, while other significant deposits (larger than 1 million ton) are found in 20 other African states. Morocco contains the largest phosphate rock reserve in the world, with total resources currently estimated at 85.5 billion m³.⁴¹

African production of phosphate rock amounted to about 33.8 million tons in 2004. While output has generally increased in Morocco and Egypt has been on a rising trend in recent years, it has been stable or even down-trending in other countries. Morocco, the leading producer, accounted for 61 percent of continental phosphate rock output in 2004; Tunisia, 17 percent; and South Africa 8 percent.⁴²

Table 3.15: Major African Producers of Manganese (million tons)

Country	2001	2002	2003	2004	2005
Gabon	1.8	1.9	2.0	2.4	2.9
Ghana	1.0	1.1	1.5	1.6	1.7
South Africa	3.2	3.3	3.5	4.3	5.0

Source: BGS (2006)

³⁸ DME (2007)

³⁹ TradeMap (2007): International Trade Database Online: <http://www.trademap.org>

⁴⁰ IISI (2007)

⁴¹ IFA (2007): International Fertilizer Industry Association (IFA): <http://www.fertilizer.org>

⁴² BGS (2006)

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Table 3.16: African Crude Fertilizer Exports

Exports (in Thousands of USD)					
Country	2001	2002	2003	2004	2005
Algeria	16,765	16,677	10,865	18,285	N/A
Egypt	413	7,054	9,180	13,449	N/A
Morocco	373,287	364,032	362,863	420,969	513,017
Senegal	16,440	19,051	9,193	8,453	1,374
South Africa	1,494	949	3,914	1,403	3,583
Togo	43,687	41,448	34,960	48,164	34,866
Tunisia	33,725	32,190	25,706	19,745	26,581

Source: TradeMap (2007), International Trade Database Online: <http://www.trademap.org>

Phosphate rock is mainly used in fertilizer production. It is thus noteworthy that, although Africa has considerable phosphate resources and has around 12 percent of the world's population, it currently accounts for only 2 percent of world fertilizer consumption⁴³.

In 2005, the value of African exports of phosphate fertilizer amounted to more than USD 560 million. Around 95 percent of export earnings came from superphosphates. Morocco was the primary African exporter, accounting for 90 percent of total export value (Table 3.16).

The general outlook for the world phosphate market is that demand will outpace supply in the forthcoming years, with demand for phosphate fertilizers growing at an average of 2.3 percent per year. African phosphate rock production is expected to increase to 14.8 million tons (P₂O₅ content) in 2009:⁴⁴

- In Morocco, planned expansions should increase Morocco's production to 9 million tons from 2007 and onwards.
- In Senegal, production is expected to rise because of higher capacity (Tobene Mine).
- Production is also expected to rise in Tunisia in the short term, although the long-term export trend seems to be downward.

Fluorspar: World fluorspar⁴⁵ production in 2005 is estimated at 4.98 million tons, up from 4.87 million tons in 2004; 4.48 million tons in 2003; and 4.18 million tons in 2002. The market in 2005 continued to be dominated by China, with an estimated

⁴³ IFA (2007)

⁴⁴ Ibid.

⁴⁵ Fluorspar is used mainly in steelmaking and in the production of hydrofluoric acid and aluminium fluoride. Hydrofluoric acid is a key ingredient for the production of all organic and non-organic chemicals that contain the element fluorine. Aluminium fluoride is used in the production of aluminium (Mineral Information Institute (MII), 2007).

output of 2.4 million tons (48.2 percent of the world total), of which only 730,000 tons was reportedly exported, indicating a considerable inland use and continued reduction in material being made available for world markets. The other major producers were Mexico, 873,000 tons (17.5 percent); Mongolia, 358,000 tons (7.2 percent); South Africa, 275,000 tons (5.2 percent); and Russia, 210,000 tons, (4.2 percent). Namibia, Kenya and Morocco also have a considerable production (Table 3.17).⁴⁶

African fluorspar consumption accounted for only 1.5 percent of global consumption in 2005 — down from 2.3 percent in 2002. The bulk of the produce is thus exported, amounting to over 550,000 tons in 2005 (with an estimated value of USD 83 million). Furthermore, while low-grade fluorspar exports (less than 97 percent calcium fluoride) dropped by 1 percent per year, from 2001 to 2005, high grade fluorspar exports increased by 25 percent per year over the same period.

Table 3.17: Major African Producers of Fluorspar (in Thousands of Tons)

Country	2001	2002	2003	2004	2005
Kenya	118	85	80	107	109
Morocco	96	94	81	81	85
Namibia	81	81	79	104	114
South Africa	286	227	235	275	275

Source: BGS (2006)

Worldwide demand for fluorspar is expected to increase. However, the immediate outlook for the next year is a relatively stable development, with the increase in demand met by further production increases, most likely in Mexico, Mongolia/CIS and possibly also Africa. The tight market has stimulated interest in various projects, including the establishment of an aluminium fluoride plant in Richards Bay, South Africa. Price levels are also likely to remain at the current high levels, but may have peaked and could ease slightly in the medium term.⁴⁷

Other Industrial Minerals: Africa possesses significant amounts of several “other industrial minerals”, including clay and limestone. The largest of these known deposits are listed in Table 3.18. It is worth noting that Africa’s four largest clay deposits, located in Burkina Faso and Nigeria, have not been exploited to date.

Non-ferrous Metals and Minerals

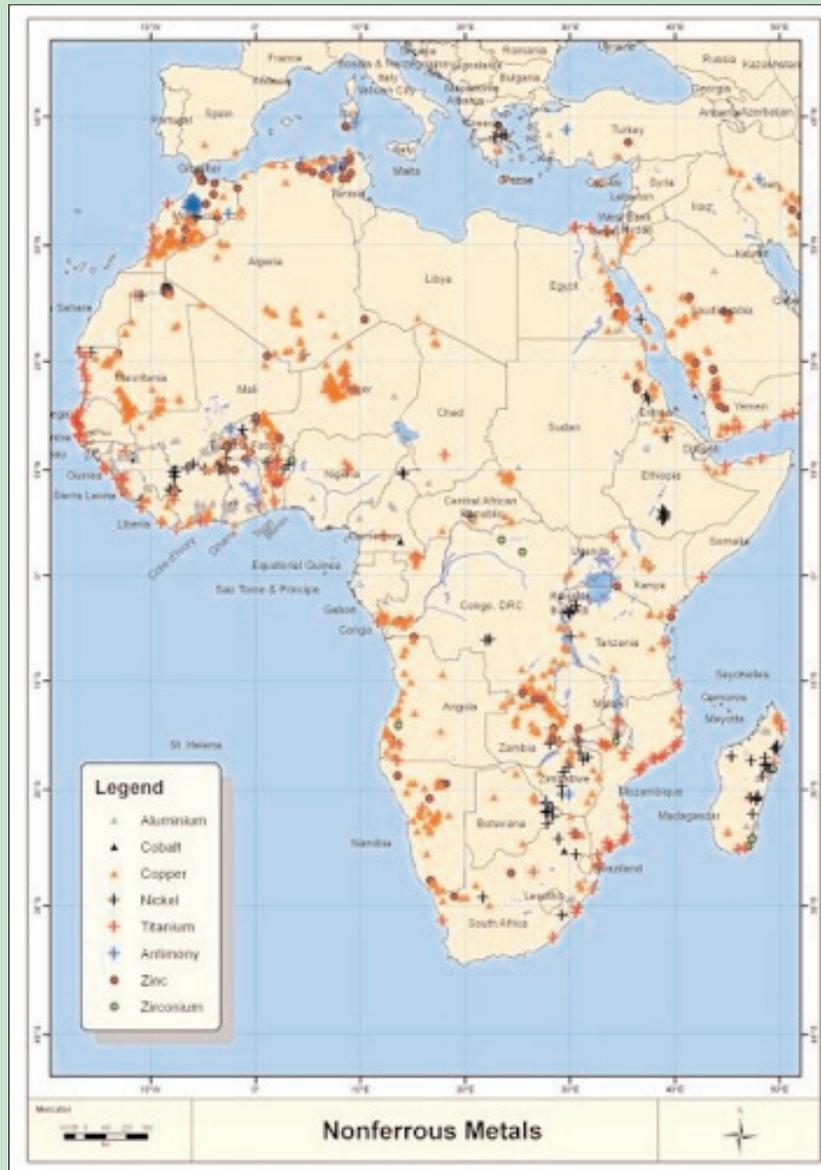
Aluminum: The majority of Africa’s aluminum resources are located in the west of the continent, with major deposits in Burkina Faso, Cameroon, Ghana, Guinea, Ivory Coast, and Sierra Leone. Other significant deposits (larger than 1 million tons) are located in 11 other African states. The map in Figure 3.7 presents an overview of the main non-ferrous metal and mineral deposits in Africa.

International Aluminum Institute figures show that African production of primary aluminum totaled 1.75 million tons in 2005, up 2.4 percent from the 1.71 million tons

⁴⁶ Mining Journal (2006); BGS (2007)

⁴⁷ DME (2007)

Figure 3.7: Major African Deposits of Non-Ferrous Metals and Minerals



Source: Council for Geoscience and Mintek (2007)

Table 3.18: Major African Deposits of Other Industrial Minerals (> 1 million tons)

State	Deposit Name	Comm1	Status
Burkina Faso	Doumtenga	Clay	Deposit never exploited
Burkina Faso	Bani	Clay	Deposit never exploited
Malawi	Changalumi	Limestone	Continuously producing
Mozambique	Salamanga	Limestone	Intermittently producing
Nigeria	Biseni	Clay	Deposit never exploited
Nigeria	Enugu	Clay	Deposit never exploited

Source: Council for Geoscience (CGS) and Mintek (2007)

produced in 2004. This rather modest increase largely reflects the ongoing expansion in Egypt and is in marked contrast to the 19.8 percent jump recorded from 2003 to 2004. However, overall, African production has increased noticeably since 2001, recording a 28.8 percent increase over this period. The expansion is attributable to capacity improvements in South Africa and Mozambique, where production increased by 27 percent and 108 percent, respectively (Table 3.19).

Meanwhile, Africa's production of bauxite, which is mined to produce alumina and primary aluminum, remained nearly unchanged in 2004 at 15.5 million tons. From 1990 to 2005, Africa's share of world bauxite production actually fell from 16 percent to less than 11 percent. Guinea accounted for about 97 percent of African bauxite production, with Ghana accounting for most of the remainder.

In 2005, African refined aluminium consumption rose 3.4 percent, while world refined aluminum consumption rose 5.7 percent to 31.6 million tons. Not

Table 3.19: Major African Producers of Primary Aluminum (in Thousands of Tons)

Country	2001	2002	2003	2004	2005
Cameroon	80	67	77	85	90
Egypt	190	195	194	216	243
Ghana	161	131	15		13
Mozambique	266	273	407	547	553
South Africa	662	706	732	866	846

Source: BGS (2006)

surprisingly, Asia showed the biggest increase with a 9.4-percent increase (consuming 14.11 million tons).

In 2005 16.5 million tons of aluminum ores and concentrates were exported from Africa, worth about USD 650 million (up 31 percent from 2004), accounting for a sizeable 49 percent of global aluminum trade. The increase was largely driven by a 160-percent rise in demand from the Ukraine. Intra-regional trade accounted for only 0.16 percent of exports. The major importers of African aluminum are Spain,

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Ukraine, Ireland, the United States, Germany, and France.⁴⁸

Global aluminum demand is anticipated to continue outstripping production in 2007 and onwards. World industrial growth is being driven by China and the United States. Chinese aluminum consumption is expected to rise 14 percent to 8.1 million tons owing to rising demand from the automobile industry, construction, and infrastructure development for the Beijing Olympics scheduled for 2008.⁴⁹

Copper: Major African copper resources are located towards southern Africa and in the Copperbelt of central Africa, with major deposits in Botswana, Burkina Faso, the DRC, Namibia, South Africa, and Zambia. Other significant deposits (larger than 50,000 tons) are located in 17 other African states.

The Copperbelt, a curved zone measuring 600 km in length by 50 km in width, contains one of the world's greatest concentrations of copper and cobalt deposits. The arc of the deposits extend from Ndola, Zambia, in the east (including the well-known Zambian mines), stretches across the border into the DRC, back into the northwest portion of Zambia, and west into Angola. The Copperbelt deposits are truly exceptional on a world scale, with most having original resources measuring hundreds of millions of tons of ore with grades greater than 2 percent copper. For example, Nchanga in Zambia contains 450 million tons at 4 percent copper, while the

cobalt-rich Kolwezi district in the DRC totals over 600 million tons at a grade of 7 percent copper equivalent. The Copperbelt remains largely unexplored using modern exploration practices and new ore bodies similar to the present deposits await discovery.⁵⁰

In 2005, Africa's total copper mine output was 669,000 tons, an 8.9 percent increase compared with 2004, with Zambia and South Africa leading (Table 3.20). Africa's refined copper production rose nearly 6 percent from 2003 to 2004; increased production in Zambia more than offset lower South African production. In comparison, world refined copper production rose by 800,000 tons (4.9 percent) to 17.3 million tons in 2006. This rise was in-line with global GDP growth projections of 4.9 percent.⁵¹

In 2006, world refined copper consumption increased from 16.6 million tons to 17.0 million tons. However, African consumption of refined copper accounted for only 1 percent of global consumption

**Table 3.20: Major African Copper Producers
(Mine Production, in Thousands of tons)**

Country	2002	2003	2004	2005
Zambia	307	346	412	435
DRC	28	56	69	98
Namibia	18	16	11	10
South Africa	90	89	85	103

Source: BGS (2006)

⁴⁸ TradeMap (2007): International Trade Database Online: <http://www.trademap.org>

⁴⁹ DME (2007)

⁵⁰ Creamer Media (2005)

⁵¹ BGS (2006)

Table 3.21: Copper Production and Consumption (in %, 2005)

	Developed Countries	Africa	L. America and the Caribbean	Developing Asia	SE Europe and CIS	All Regions
Copper production	43	9	21	6	21	100
Copper refined production	34	4	22	27	13	100
Copper consumption	46	1	6	42	5	100

Source: UNCTAD (2006)

(Table 3.21). South Africa alone accounted for more than 80 percent of Africa's refined copper consumption.⁵²

Most of Africa's copper production is exported in refined form. Copper exports contribute heavily to the export earnings of Botswana, the DRC, and Zambia. The outlook for African copper mine production is very promising, and the output could nearly double as early as 2009:⁵³

- Output is likely to rise sharply in Zambia (owing to ramping up of production, expansion, and opening of new mines from 2005 and onwards).
- Production in Congo could more than triple by 2009 (development of new mines).
- In Mauritania, the Guelb Moghrein Mine has started production.
- Mining from a copper-rich zone at Bisha is likely to start in Eritrea in 2010.
- However, Congolese production is likely to decline by 2011 (shutdown of mines).

⁵² DME (2007)

⁵³ USGS (2007)

Nickel: African nickel resources are well spread out throughout the continent, with major deposits (larger than 100,000 tons) in Botswana, Burundi, Ivory Coast, and Madagascar. Other significant deposits (larger than 50,000 tons) are located in 11 other African states.

In 2005, African nickel mine production increased by over 5 percent; output increased in both Botswana and South Africa, but decreased in Zimbabwe (Table 3.22). The majority of South Africa's nickel output was a co-product of platinum mining.⁵⁴

Table 3.22: Major African Nickel Producers (Mine Production, in Thousands of Tons)

Country	2001	2002	2003	2004	2005
Botswana	22.4	23.8	27.4	22.2	28.2
South Africa	36.4	38.4	40.6	39.8	42.4
Zimbabwe	8.0	7.8	6.6	9.7	7.7

Source: BGS (2007)

⁵⁴ BGS (2006)

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Africa accounted for only 3 percent of global nickel consumption in 2005. South Africa was the primary African consumer, with the stainless steel industry accounting for most of the demand.⁵⁵

African exports of nickel have increased dramatically in recent years, with an annual growth rate of 221 percent from 2001 to 2005. Global exports of nickel ores and concentrates were valued at USD 298 million in 2005. However, by volume, African exports represented 1.5 percent of global nickel ore traded. Intra-regional trade accounted for a large portion of African nickel exports, with 74 percent going to South Africa. China recorded the biggest year-on-year export growth in 2005, with an increase of 343 percent from 2004.⁵⁶

The outlook for expanding nickel production in Africa is bright, with several countries investigating promising opportunities — including Botswana, South Africa, Tanzania, Zambia, and Zimbabwe. Of these countries, Botswana and South Africa already produce nickel and are most likely to see new or expanded capacity in the near future. Some expected country by country developments are as follows:⁵⁷

- The startup of the Ambatovy nickel and cobalt mine in 2008 in Madagascar is a significant development and will account for the majority of the increase in African production in coming years. Madagascar, which did not mine nickel until 2005, could

have a 40 percent share of African nickel mine production by 2011.

- By 2009, South Africa's output is expected to rise by about one-third, most of which would be attributable to increased capacity at the Nkomati Mine.
- In Zimbabwe, the Shangani Mine is expected to close by 2008, and the Hunter Road Mine to open by 2011.
- Botswana's production is likely to fall because of the shutdown of the Selebi-Phikwe Mine in 2011.

Zinc: Africa produces 4 percent of global zinc. The majority of its zinc deposits are located towards the north, west, and south east of the continent. Deposits are found in Algeria, Burkina Faso, DRC, Kenya, Namibia, South Africa, Tunisia and Zambia (Table 3.23) In 2005, South Africa was ranked 8th in terms of worldwide zinc reserves.⁵⁸

Table 3.23: Major African Zinc Producers (Mine Production, in Thousands of Tons)

Country	2001	2002	2003	2004	2005
Namibia	37.6	41.0	108.0	202.0	246.0
South Africa	61.2	64.2	41.2	32.0	32.1
Tunisia	40.0	35.7	38.0	29.0	15.7
Algeria	5.7	4.5	1.5	0.1	2.2
Morocco	89.6	90.5	85.2	87.0	128.0

Source: BGS (2006)

⁵⁵ DME (2007)

⁵⁶ DME (2007); USGS (2005)

⁵⁷ USGS (2005)

⁵⁸ DME (2007); Council for Geoscience (CGS) and Mintek (2007)

Although Africa produces 4 percent of global zinc, it consumes only 2 percent of it. Since 1995, there has been a significant shift in the global distribution of zinc usage. The largest consumer region ten years ago was Europe, which held a third of the market — followed by the USA (16 percent), and China and Japan (10 percent each). By 2005, China had become the most important user of refined zinc metal, with a 28 percent share of the market, Europe's share was 25 percent; while that of the USA and Japan had fallen to 10 percent and 6 percent, respectively.⁵⁹

In 2005, Africa exported 282,911 tons of zinc (2 percent of the global market) at a value of USD 83.8 million. Spain and France were the two major importers of African zinc, importing 21 percent and 20 percent, respectively. Spanish imports grew 32 percent between 2001 and 2005. The clear outlook is that African zinc mine production is likely to increase:⁶⁰

- The majority of expected increases in 2007 are attributable to higher production from the Hajar Mine in Morocco.
- In South Africa, the expansion of the Black Mountain Mine is expected to increase production substantially.
- Output is also likely to increase in Algeria.
- In Congo (Kinshasa), the proposed reopening of the Kipushi Mine and other activities may lead to further increases in production.

- Higher production from the Skorpion smelter in Namibia alone could increase regional production of zinc metal by 12 percent in 2007. Namibia could thus account for 54 percent of Africa's zinc metal output in 2007.

The African Development Bank's Engagement in Africa's Extractive Industries

The overarching objective of the AfDB's engagement in extractive industry (EI) issues in Africa is to help its regional member countries (RMCs) use natural resources to achieve sustainable development, reduce poverty, and improve standards of living on the continent. Africa's *non-renewable* natural resources are considerable and the extractive industries have a very high potential to contribute to economic growth and poverty alleviation in resource-rich countries. Engaging in EI activities is therefore consistent with the core mission of the Bank.

In the early 1990s, the focus of RMCs' development strategies shifted from public to private sector-led growth. Consequently, the Bank also shifted its interventions in the EI sector from assisting the rehabilitation or expansion of large-scale public sector companies to

- promoting initiatives (institutional capacity building and policy reforms) that encourage private investment in the sector; and
- direct investments in private sector operations.

In addition, recent reforms supported by Bank Group programs have sought to

⁵⁹ ILZSG (2007): International Lead Zinc Study Group (ILZSG): <http://www.ilzsg.org/>

⁶⁰ USGS (2005)

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address public financial management in resource-rich countries and stressed pro-poor public expenditures and job creation for vulnerable groups — in particular, those living in the zones where the extractive industries are located.

With respect to capacity building, the Bank Group has supported the efforts of several resource-rich RMCs to strengthen the capacity of institutions dealing with or involved in the management of the EI. In this regard, the Bank has supported activities such as (i) modernizing mining cadastre and geological surveys, to make them useful information tools for potential investors; (ii) strengthening the environmental management capacity of EI sector institutions; and, (iii) training stakeholders, government staff and others involved in the management of the sector. Bank Group EI sector activities are underpinned by several supportive policies (Industrial Sector Policy for Public Sector Operations, Private Sector Operations Policies, Enclave Projects Policy, Environmental and Social Policies and Guidelines).

The Bank's EI activities prioritize transparency, governance, and corruption. In line with its commitment to transparency and accountability and with its policy on good governance, the AfDB formally endorsed the Extractive Industries Transparency Initiative (EITI) at the Third Plenary EITI Conference held in Oslo in October 2006. The AfDB, as well as the World Bank and the International Monetary Fund, now holds an observer seat on the new EITI Board.

Several studies and other support activities have been, or are being under-

taken as part of the AfDB's activities in the EI sector. These include the following:

- A survey of donor-funded technical assistance for building capacity in EI governance in Africa, with the objective of identifying gaps and overlaps. (This survey was initiated in collaboration with the World Bank and NORAD);
- A study on EI governance in Africa, focusing on the scope of the African "resource boom", the risks that it brings in light of past experience, and how EI revenues can be translated into sustainable development;
- Global advocacy for improving EI sector governance in Africa and creating political will and institutional capacity among RMCs to endorse and implement the EITI; and
- Exchange of knowledge among oil, gas, and mining specialists from the World Bank, NORAD, and the AfDB. An experience-sharing meeting between the AfDB and World Bank oil, gas, and mining specialists took place in Tunis in February 2007, during which agreements were made to increase collaboration in EITI implementation, create a legal rapid response advisory facility for resource-rich RMCs, develop small-scale mining, and support the creation of a geological database for RMCs.

The Bank Group's Legal Service Department is working on the establishment of an African Legal Support Facility under the Bank's "Law for Development Strategy". The Facility will ensure that RMCs have

access to the requisite legal support services needed to further their development objectives. The specific EI-related services to be provided by the Facility include

- the provision of technical support for the preparation of appropriate EI laws and regulations in RMCs;
- a review of existing legislation to ensure that budget, revenue, taxation and related laws allow for proper public disclosures;
- training workshops for legal and financial advisors from RMCs to help strengthen their negotiating capacities in EI; and
- the provision of technical legal support during EI contract negotiations.

Furthermore, as part of its commitment to global advocacy for transparency and accountability, the Bank

- hosted the Big Table 2007 on “Managing Africa’s Natural Resources for Growth and Poverty Reduction”, in collaboration with the Economic Commission for Africa (ECA);
- hosted a session on “Transparent Management of EI Revenues: Making the dividends work for poverty reduction” during the Seventh Annual Conference of the Parliamentary Network in Cape Town;
- convened a high-level symposium during the 2007 AfDB Annual Meetings on “Fragile States and the Role of Extractive Industries”;
- devoted the theme of the 2007 African Development Report to “Managing Natural Resources for Sustainable Development in Africa”; and

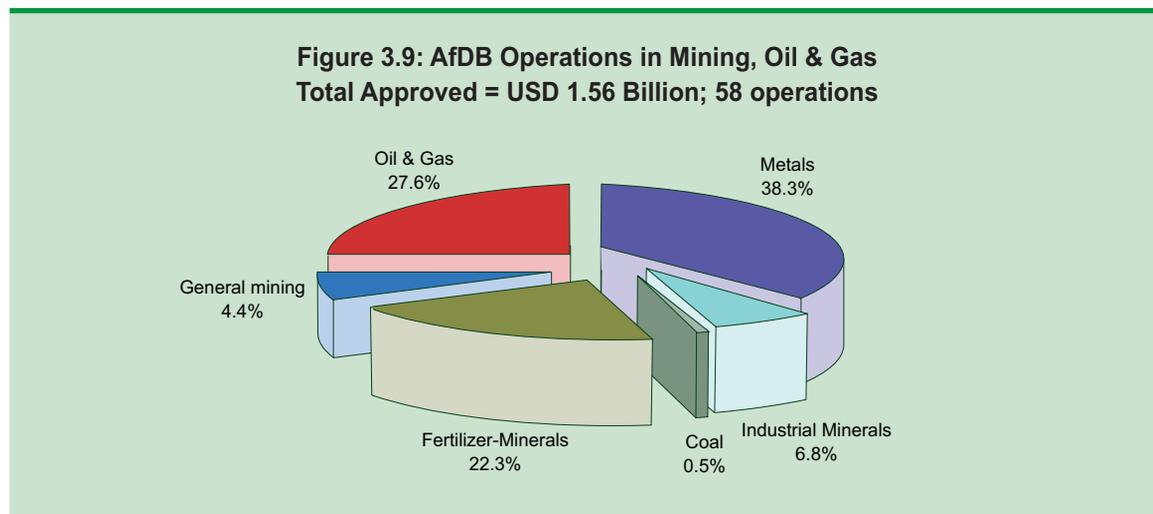
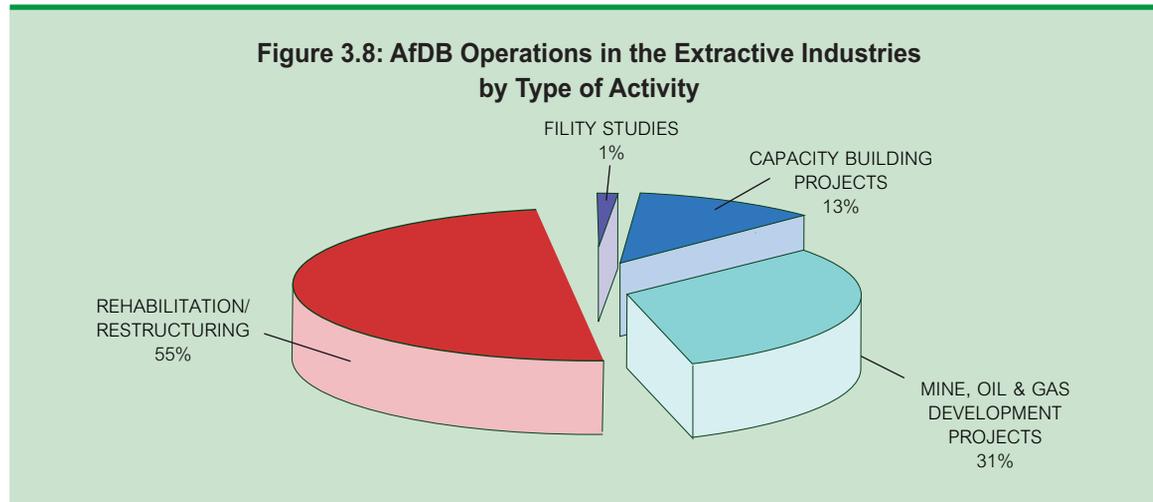
- carried out policy-based research on the impact of high oil prices the state of oil and gas in Africa and the African Petroleum Fund, to facilitate informed dialogue and decision making by RMCs.

To date, the cumulative volume of the AfDB lending to the EI sector over the last three decades stands at approximately USD 1.6 billion, and the annual growth rate of lending has averaged 20 percent since the mid-1990s.

The Bank’s investments in the extractive industries have focused on direct investments through public and private sector windows to develop and enhance productive capacity (investment in mining, oil and gas extraction activities), rehabilitation and restructuring support. These operations account for 86 percent of the Bank Group’s total lending to the EI sector; technical assistance for capacity building had been allocated 13 percent; and support for feasibility studies the remaining 1 percent (Figure 3.8).

Sector-wise (oil and gas versus metals, and so forth), the most significant resource in terms of Bank Group investments is the metal sub-sector, which accounts for about 38 percent of the Bank’s operations in the EI sector. Bank Group support to the oil and gas sector stands at 27.6 percent, and to the “fertilizer-minerals” sector, 22.3 percent (Figure 3.9).

The Bank has financed 48 operations through its public sector window, for a total of over USD 1.1 billion. Examples of these operations include the rehabilitation of the copper industry in Zambia; the development



of an oil pipeline between Tanzania and Zambia; the modernization of the phosphate industry in Tunisia; the development of gold fields in the Democratic Republic of Congo (DRC); the expansion of the iron industry in Mauritania; and the production and transformation of bauxite in Guinea. Other projects have addressed the social and

environmental aspects of the EI sector. With respect to direct lending, private sector investments in the EI sector have been increasing since the establishment of the private sector window and the granting of the first such loan in 1993. As of April 2007, ten private-sector operations had been financed for a total of USD 421 million. The volume of

private sector lending to the EI sector is expected to continue to grow in coming years.

The Bank Group's non-lending activities in the EI sector are relatively new. Several studies, workshops, and seminars have recently been launched and the Bank has formerly endorsed the EITI (as mentioned above). With respect to economic and sector work, a number of studies are in their final stages (for example, the impact of high oil prices on African economies, the state of oil and gas in Africa, natural resources management in Africa).

The Bank's experience in the EI sector has been mixed. A review of project completion reports for several Bank-financed projects reveals that while the development impact of some operations has been positive, the impact of others has been rather limited. However, given the small number of operations financed by the Bank and the relatively low volume of its lending to the EI sector, it can be concluded that the Bank's contribution to the development of the sector in Africa has generally been limited and falls short of its potential. In fact, the Bank has provided only a small portion of the financing invested in the sector, and EI lending represents a very small share (3.4 percent) of the Bank's total lending. In addition, the Bank's activities in the sector have not been undertaken within the framework of a comprehensive strategy, and thus challenges posed by the sector are yet to be addressed in a comprehensive manner.

The Bank is taking steps to address this situation. These include the creation of a Governance Division and a Natural Resources and Environmental Management

Division under the recent reform (restructuring) implemented at the Bank. These Divisions are now actively engaged in these issues. The most recent milestones reached in this regard include a *Task Force Report* on the Bank's engagement in the extractive industries, as well as recent proposals submitted to the Board regarding support for EITI implementation in five RMCs.

Management of Non-Renewable Natural Resources

The rest of this chapter summarizes the various approaches used by African nations to manage, conserve, and enhance their minerals and fossil fuels and the benefits and wealth they can reap from utilizing these resources. In this regard, it is important to recognize that renewable and non-renewable resources are fundamentally different in character and are thus managed differently. This applies to the extraction and utilization process itself, policies, regulations, revenues and taxation, sustainability, rehabilitation and all other key aspects.

To create and sustain wealth in the long term, mineral resources have to be converted into other forms of capital (human, financial, and manufactured) and more sustainable livelihood opportunities. Between 2000 and 2005, world trade value in minerals grew by 17 percent per year, while production rose by 2.5 percent. Mineral prices are highly volatile, but, in general, they have risen significantly over the past five years, driven in part by high demand and growth rates in China and India⁶¹. As outlined in detail in the previous

⁶¹ OECD (2007)

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sections, Africa has considerable non-renewable resources: some are currently being extracted, some are recognized reserves, and others are yet to be discovered. The growing interest in African resources is thus fundamentally about its non-renewable resources. This current scramble for African resources is gaining considerable international attention (further discussed in Chapter 4).

Overall, the management of non-renewable resources involves

- ensuring availability (exploitation and extraction) of the resources;
- allocating resources amongst competing players — may entail participation of local versus international players;
- creating an environment for resource industries to flourish;
- ensuring integrity in the management of revenues received from the extraction, mining, and processing of resources;
- developing policies to manage national ownership of non-renewable resources;
- limiting the environmental impact of the exploitation of resources;
- ensuring health and safety in the process of resource exploitation;
- converting resource use into sustainable economic development through linkages; and
- using resource rents for the development of economic and social capital and ensuring the overall creation of wealth and wellbeing in a country.

A key concern is that African governments that are major producers of fossil fuels and minerals do not receive (sufficiently) large rents or revenues from the production of these extractive products. This may stem from a number of reasons, including: fiscal regimes that are not designed to extract maximum rents; and mineral policies that are designed primarily to favor the promotion and attraction of investments and have not evolved with the changing global dynamics and national interests.

It may be time to challenge the conventional wisdom, including resource governance policies promoted by multilateral institutions in the 1970's — which are no longer appropriate because circumstances have changed. Many of these policies are pro-private sector, and, in many instances, do not ensure maximum benefits for the countries supplying the resources. A key emerging issue is tax avoidance, partly due to transfer pricing, an issue the existing mineral policies did not anticipate.

The previous sections in this chapter presented a status assessment and breakdown of non-renewable resources in Africa, as they are known and recorded at present (many resources are undoubtedly yet to be discovered). These resources have been managed with highly different results by different peoples and nations on the continent. In some countries, the resources have provided the backbone for strong economic and social growth; in others, they have directly or indirectly led to conflicts and even economic downturns. It is evident that natural resource wealth and management of minerals and fossil fuels raise unique challenges and include an element of vulnerability to “boom

and bust cycles” and to the “Dutch Disease” syndrome. The paradox of natural resource wealth and the so-called “Resource Curse Syndrome” is discussed at length in Chapter 4.

Using an analytical framework, this section focuses on analyzing and presenting current management practices in Africa. The framework draws on the experiences of resource-based economies that have successfully strengthened and diversified their economies from resource capital (these include relative success stories such as Botswana and also, to a considerable extent, South Africa).

Framework for Natural Resources Management

The key feature of the framework, which is based on experience and on track records, is that a proper natural resource policy comprises a legislative framework as well as fiscal terms and policies that promote the sustainable exploitation of natural resources. The framework includes a comprehensive description of the purpose of, and characteristics of effective natural resource management — thus implying that a crucial element is *implementation or enforcement* of policies and strategies.

While most of the framework presented above is self-explanatory, some additional remarks are relevant with regard to fiscal regimes and sustainable development of non-renewable resources.

Fiscal Regimes: for fossil fuels and minerals in Africa are by no means uniform. A multitude of royalties, taxes, resource rent, incentives, state equity levels, and so on, have been developed to foster interest in

exploration and investments, on the one hand, and capture some of benefits for the state and the public, on the other hand. Tables 3.25 and 3.26 below outline key characteristics of fiscal regimes in Africa; Table 3.25 presents the fiscal petroleum regimes applied and Table 3.26 the mineral taxation used in selected countries. As clearly demonstrated, the levels and principles applied are as heterogeneous as the landscape and people in Africa.

Sustainable development: of non-renewable resources encompasses all the policies, principles, and practices that support the utilization of mineral resources in a manner that does not prevent future generations from accessing the mineral resource(s) or its benefits⁶². A key purpose is to ensure that mineral-hosting nations in Africa benefit from their mineral endowments in the short and long terms, for example, by using the revenues accrued from mineral resource developments for socio-economic development programs, the creation of manufacturing industries, and other initiatives (further discussed in Chapter 5).⁶³

Mining labor inputs and direct or indirect natural resource extraction employment is an important issue that is often overlooked in Africa and that should be coordinated efficiently within a country’s mining policy. A proper extraction policy should, for instance, provide guidelines for the inclusion of foreign labor coupled with a concise framework for trans-migration and local district hiring. Other issues, often lacking in

⁶² UNECA and AfDB (2007)

⁶³ Rogers (2007)

Table 3.24: Framework for Management of Natural Resources in Africa

Criteria	Description	Purpose
Natural Resource Policy	A key document that outlines the stakeholder's objectives in the exploitation of natural resources. It addresses all issues related to the exploitation of natural resources.	<ul style="list-style-type: none"> — Coordinate the use of natural resources by prescribing the role of the government and that of stakeholders (those who affect or are affected by the natural resource) in relation to the exploitation of natural resources. — Enable the exploitation of natural resources in line with sustainable development practices. — Ensure the use of revenues accrued from the exploitation of natural resources for investments, e.g. infrastructure or socio-economic development programs.
Legal and Regulatory Framework	The legislative framework outlines the relevant elements of the natural resource policy in detail, setting the legal and regulatory framework, including procedures to be followed in the exploitation of natural resources.	<ul style="list-style-type: none"> — Provide a legislative framework that administers the exploitation of natural resources. This includes penalties for those who violate the laws governing the exploitation of natural resources. — Provide licenses, permits and rights for natural resource exploitation.
Fiscal Regime	This section of the natural resource policy illustrates fiscal terms and policies pertaining to the exploitation of natural resource.	<ul style="list-style-type: none"> — Provide fiscal terms that administer all commercial activities pertaining to exploitation of natural resources; for example, the imposition of taxation measures that are enforced to compel those who exploit natural resources to provide compensation. — Non renewable resources should generally have higher (and specialized) taxation levels than other resources as they cannot be replaced; i.e. so economic rents compensate for their removal.
Sustainable Development	The section of the natural resource policy that promotes sustainable exploitation of natural resources. Sustainable development entails social, economic, and environmental issues. Non-renewable natural resources and renewable natural resources are managed differently, due to the "unsustainable nature" of non-renewable resources.	<ul style="list-style-type: none"> — Ensure respect of sustainable development principles. If properly prepared and implemented, policies tied to sustainable development promote socio-economic and environmentally sustainable exploitation of natural resources. This also includes "derived effects" of the exploitation. For example, promoting proper co-ordination of waste management. Waste that emanates from the exploitation of natural resources should be managed effectively so that it does not surpass the capacity of the natural environment to absorb the waste products.

Source: Adapted from Otto & Cordes (2004)

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Table 3.25: Key Characteristics of Fiscal Petroleum Regimes

Country	Royalties	Production sharing	Income tax rate	Resource rent tax	D.W.T. (nonres)	Investment incentives	State equity
Angola	...	15–80%(P)	50%	None	...	Yes (E)	25%
Cameroon	Negotiable	None	48.65%	None	25%	Yes (O)	50% (C)
Chad	12.5%	None	50%	None	20%	None	10%
Gabon	10–20%	65–85%(V)	Gov. Share	None	...	Yes (E)	15% (C)
Mozambique	8%	10–50%	40%	None	...	Yes (E)	None
Niger	12.5%	None	45%	None	18%	Yes (E)	...
Nigeria	0–20%	20–65%	50, 85%	None	10%	Yes (E, Cr)	Variable
Sudan	None	60–80%	None	None	None	...	None
Algeria	10–20%	60–88%(P)	Gov. Share	None	20%	None	30% (C)
Egypt	10%	70–87%(V)	Gov. Share	None	None	Yes (I)	None
Libya	16.67%	5–90%	None	None
Tunisia	2–15%	None	50–75%	Yes(ror)	None	Yes (E, U, I)	Negotiable

Notes: 1/ Production sharing linked to physical volume of production (V), years of production (T), or realized profitability (P)

2/ Investment incentives: tax holiday (H), accelerated depreciation (A), tax credit (Cr), current expensing of exploration and / or development cost (E), duty exemption for imports of equipment and capital goods (I), unlimited loss-carry forward (U) and other (O)

3/ The maximum equity share that the state can select to take, often on a carried basis (C)

Source: Adapted from ESMAP (2004)

Table 3.26: Mineral Taxes in Selected Countries

Country	Corporate Income Tax	Royalty/Mining License Tax	Value Added Tax (on Imported Equipment)	Typical Import Duty	Typical Export Duty
Botswana	25%	15% of realized value	n/a	n/a	n/a
Ivory Coast	35%; excess profit tax applies at profit threshold	2.5–3% of mine mouth value-rates vary by mineral	10% — exemption is possible on a case by case basis. There is no refund on VAT	0.75% exemption is possible on a case by case basis	Export duty only on diamonds, (18%)
South Africa	30%+STC (rate on dividend), but special rules for gold mines.	Rates determined by contract; 1–8% gross revenue royalty	14% — refundable within a month in case of exports	Duty applies to spares and components	None

Source: Shukla (2007)

Box 3.1: Artisanal and Small-Scale Mining in Africa

Most attention in the mining industry is focused on large operations, governments, private companies, and so forth. However, in many parts of Africa, extraction of minerals by artisanal and small-scale mining is a very important activity. It is conducted by people working with simple tools and equipment, usually in the informal sector, outside the legal and regulatory framework. The vast majority are very poor, exploiting marginal deposits in rural, harsh, and often dangerous conditions.

Artisanal mining is first and foremost a livelihood strategy, and, for many people, represents the most promising, if not the only, income opportunity available. It is certainly not without challenges and problems, including, for example, concerns about environmental damage (such as the use of mercury in gold mining); social disruption and conflicts over land and income; poor health conditions including the spread of HIV/AIDS; unsafe operations and frequent accidents; child labor; and the general unregulated nature of the activities. Artisanal miners often work seasonally (for instance, gemstone mining in Malawi in the dry season), sometimes even on an *ad hoc* day-to-day basis, which further complicates any formalization effort.

Recent research estimates that some 13 million people work directly in artisanal and small scale mining worldwide, and the livelihoods of no less than 100 million are significantly affected by related activities, but usually in appalling conditions.⁶⁴ Some very conservative estimates for workers directly engaged in Africa are: 100–200,000 in Burkina Faso; 200,000 in Ghana; 40,000 in Malawi; 200,000 in Mali; 60,000 in Mozambique; 550,000 in Tanzania; and 350,000 in Zimbabwe. The numbers are expected to increase very rapidly with the rising prices of minerals and gemstones, especially in parts of Africa where there are conflicts or where economies continue to falter (for instance, Zimbabwe). Furthermore, according to the International Labour Office, in recent years artisanal and small-scale mining have accounted for 15–20 percent of the world's non-fuel mineral production.

In most cases, governments and many others have had a very negative view of artisanal mining activities, but have often *de facto* left it alone and not attempted to optimize it in order to obtain revenue from the operations (legalize it) or to mitigate its negative consequences.

Source: Mining, Minerals and Sustainable Development Project (MMSD) (2002)

current regimes, include education, training, and skills development for employees as well as adherence to safety and health measures.⁶⁵ A further, often highly neglected aspect of management of resources and mining operations in Africa, is the considerable number of people engaged in artisanal and small-scale mining (Box 3.1).

The following specific principles, which are also largely absent in the majority of African countries, can improve and enhance

extraction to ensure more sustainable development:⁶⁶

- preserving strategic minerals of importance for future development (and generations),
- enforcing production quotas or caps,
- limiting the number of exploitation licenses used, the areas available for exploitation or the number of extraction sites,
- ensuring longer mine life by limiting annual capacity,

⁶⁴ World Bank (2007)

⁶⁵ Ibid.

⁶⁶ Otto and Cordes (2004); Rogers (2007)

- establishing a profits trust framework,
- establishing punishment and incentives to promote potential alternatives, and
- positioning current unprofitable tailings and spoils.

Case examples of Management Principles Applied in Africa

Africa's experience in natural resource management is mixed. For example, it is

generally recognized that oil-rich countries in sub-Saharan Africa, in particular, have not reaped the full benefits of oil. This section focuses on the application of management principles in Africa. The analytical framework presented above is used to analyze key features and aspects of the application of management principles in selected countries in Africa (Table 3.27): Nigeria (fossil fuels); Algeria (fossil fuels); Gabon (fossil fuels, and some metals); Angola (fossil fuels and some

Table 3.27: Management Principles Applied in Africa — Case Examples

Country	Natural Resource Policy	Legal and Regulatory Framework	Fiscal Regime	Sustainable Development
Nigeria	Formulation involved stakeholders. Social, economic, and environmental aspects of mining included. Coherent and appropriate.	Mineral endowments are vested in the government, but the mining law encourages private ownership. A coherent mineral law.	Fiscal policy is comprehensive with many features and options for reductions but also requirements, which may deter some investors.	Relevant policies aimed at achieving sustainable development endorsed, but framework can be modified, e.g. to enact mining closure plans
Algeria	Unique (appropriate) method adopted in formulation of policies. Policy meets the recommended criteria. Aim is to attract foreign direct investment.	The legislative framework is coherent and, in most aspects, meets the criteria for appropriate management.	Fiscal regime is coherent and, in most aspects, meets sound management criteria. The State also has options to acquire equity stakes.	Necessary mechanisms required to promote sustainable dev. in mining industry endorsed. Responsible ministries are active, etc.
Gabon	Policy is not a rational mineral policy as it lacks a coherent fiscal framework and other key aspects.	Basic features of mineral legislation present, but not entirely coherent.	Basic features are present, but regime is not comprehensive or coherent.	Some key aspects are addressed, but strategy and approach are not entirely coherent or comprehensive.
Angola	Main objectives are clear (e.g. to reduce state-owned mining). However, policy could be more comprehensive and also target what the considerable revenues should be used for.	Adequate and relevant, but mining rights could be more descriptive in illustrating the process of acquiring and utilizing mineral rights.	Fiscal regime is substantiated by several mechanisms that regulate relevant commercial activities and taxation incentives, etc. It has sound priorities.	In principle, appropriate mechanisms developed. Plans to train local people in order to involve them in the petroleum industry.

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Table 3.27: (continued)

Country	Natural Resource Policy	Legal and Regulatory Framework	Fiscal Regime	Sustainable Development
South Africa	Formulation entailed participation of all main stakeholders and a white paper was issued for public comment. In principle, addresses all key issues and is very comprehensive.	Legislation is comprehensive, concise, and stable. Several pieces of supportive legislation enacted (e.g. on social aspects).	Fiscal regime is very comprehensive, perhaps too much in some cases, as this could deter investors.	Several important mechanisms put in place to meet the social, economic and environmental impacts of mining. In other words a good example for others.
Tanzania	Formulation process heavily influenced by international donors and stakeholders, but meets the most important criteria.	Legislative framework incorporates most relevant key features, such as the right to trade in mineral rights and improved security of tenure.	Taxation and the fiscal regime are concise and, in principle, adequate.	Key principles have been developed, but further efforts needed to execute sustainable development initiatives efficiently. Mining closure needs more attention.
Ghana	Meets key criteria recommended for a coherent mineral policy	The mineral legislation clearly illustrates the framework required for proper administration of the mineral sector	Stable and concise fiscal framework	In principle, a significant number of relevant mechanisms are in place. However, resources appear to be lacking.

Sources: Assessments extracted from Campbell (2004); Mines2006 (2006); Dales (2006); USGS (2005)

metals and non-metals); Ghana (bauxite, aluminum, gold, manganese ore and silver); South Africa (gold, platinum, nickel, uranium, vanadium etc.); and Tanzania (primarily gold, nickel, iron ore and titanium).

Summarizing and Looking Forward

The overview and description of key issues and the analysis of the selected case countries reveal that all countries assessed have taken important steps to formulate policies and legislation, and incorporate fiscal terms into their strategies. However, more coherent principles, structures and, above all, due

diligence in enforcement would considerably increase benefits and sustainability for all countries. Some concrete issues related to sustainable development need to be improved. These include, incorporating environmental aspects and the full extraction cycle, including mine closure and rehabilitation. Above all, although the countries have the means and measures in place to secure significant economic and social benefits from fossil fuels and mineral exploitation, a number of key questions remain:

- Are the countries in Africa benefiting *enough* considering the resources at hand?

Box 3.2: Diamond Mining in Botswana

Botswana is a unique example in many ways and provides a striking example of how a developing country can use its mineral wealth (diamonds) for poverty reduction. It has evolved from one of the poorest countries in the world to a middle-income country. This success has been widely attributed to sound economic policies, especially in managing its large diamond resources, and to a commitment to fiscal stability.

At independence in 1966, Botswana was a country with one million people and an economy that was dependent on the cattle industry. The first government after independence made two decisions that would later prove to be crucial for growth and development. A Mines and Minerals Act gave all mineral rights to the state rather than to tribal authorities. Foreign firms were invited to engage in exploitation for minerals. It soon became apparent that the country was richly endowed with, amongst other assets, kimberlitic diamond deposits. The second crucial decision was the renegotiation of the deal with the mining firm, DeBeers in 1975, allocating half of all profits from diamond revenues to the state. The government channeled its revenues, primarily from diamond exports, into investments in education, health care, and infrastructure, while maintaining tight fiscal control. A contributing factor was the creation of a set of rules, a Sustainability Budget Index, to avoid fiscal deficits by keeping track of the ratio between consumption expenditures and non-mineral revenues. Natural resources revenues are used for investments rather than for consumption as long as the ratio remains less than one.

Furthermore, Botswana has had a well-functioning democracy and, all in all, a transparent administration (the good governance dimension). As a result, it has experienced almost three decades of high growth rates. By the late 1990s, the country had risen to the status of a middle-income country.

Source: OECD (2007)

- Is the wealth created reaching the poor and the general populations to a sufficient degree? and
- Are the resources ultimately benefiting the countries?

Africa's track record certainly varies, and policy- and decision-makers need to learn from both good (see Box 3.2 on Botswana) and bad experiences.

By and large, as demonstrated by the case examples, many countries in Africa do, in fact, have policies, legislation, and fiscal regimes in place that would ensure sustainable exploitation of natural resources and shared benefits across the society — with some relevant modifications. Unfortunately,

the implementation of the principles and the legislation is an entirely different dimension for the majority of the countries. In other words, lack of enforcement, poor institutions, limited transparency, and poor governance are the problems. Good governance is critical if the benefits from mining are to reach the poor and contribute to stable growth. Recent debates have emerged on ensuring greater development outcomes from mineral extraction. Four central issues have emerged from recent experiences: (i) fairer contracts; (ii) revenue transparency; (iii), and (iv) mining communities and beneficiation (adding value prior to export). These issues are analyzed in some detail in Chapters 4 and 5.